

# इंटरनेट

# मानक

## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 7332-3 (1994): Spherical valves for hydropower stations and systems, Part 3: Recommendations for operation and maintenance of spherical valves [WRD 12: Hydraulic Gates and Valves]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



भारतीय मानक

पनबिजली घरों एवं व्यवस्था के लिए गोलाकार  
वाल्वों का मसौदा

भाग 3 गोलाकार वाल्वों के प्रचालन तथा रखरखाव की सिफारिशें  
( पहला पुनरीक्षण )

*Indian Standard*

**SPHERICAL VALVES FOR HYDROPOWER  
STATIONS AND SYSTEMS**

**PART 3 RECOMMENDATIONS FOR OPERATION AND MAINTENANCE  
OF SPHERICAL VALVES**

*( First Revision )*

UDC 621.646.22 : 621.224 - 225.12

© BIS 1994

**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard ( First Revision ) was adopted by the Bureau of Indian Standards after the draft finalized by the Hydraulic Gates and Valves Sectional Committee had been approved by the River Valley Division Council.

Spherical valve is a shut-off device most commonly used in hydropower stations for a head 200 m and above. These valves may be used at lower heads also. Its use is favoured at high heads as there is no hydraulic loss due to valve itself when valve is open and provides a better tight sealing when valve is closed.

It serves the following purposes:

- a) Stops the water entry to the turbine when the later is stopped to decrease the water leakages and to protect the guide vanes against silt cavitation and silt erosion;
- b) Stops the water entry in case of emergency, that is, non-closure of guide apparatus or in the event of low oil pressure in the system;
- c) Unit isolation in multi-unit plants where one penstock feeds more than one unit; and
- d) To facilitate inspection of water path passages.

Basically spherical valve consists of spherical valve, air valve and water/oil pressure system or any other control system which is required for operation of spherical valves.

This standard covers only the guidelines ( criteria ) for structural and hydraulic design of valves so as to permit necessary flexibility in their detailed design as per requirements of the designer.

These guidelines are based on the available expertise and the practices prevailing in this field at present so that the same could be utilized. As and when some more information is available the same will be incorporated in the standard. Therefore, these are expected to be used by those designers who have sufficient knowledge in this field.

This standard is being published in parts. Part 1 deals with structural and hydraulic aspects of design. Part 2 deals with the guidelines for the design and selection of the control equipment used in spherical valve. This Part 3 deals with the operation and maintenance of spherical valves.

This standard ( Part 3 ) was first published in 1974. This revision has been taken in hand so as to update its provisions based on the experience of the users in the past years and to keep in line with its basic standard, that is, Part 1.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values ( revised )'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***SPHERICAL VALVES FOR HYDROPOWER STATIONS AND SYSTEMS****PART 3 RECOMMENDATIONS FOR OPERATION AND MAINTENANCE OF SPHERICAL VALVES***( First Revision )***1 SCOPE**

This standard ( Part 3 ) covers instructions for operation and maintenance of spherical valves.

**2 PREPARING VALVE FOR FIRST OPERATION**

**2.1** All the operations of preparing the valve for first opening should be carried out in empty condition of penstock.

**2.2** Pistons of the servomotors in closed position of valve should come to end position. If required, it can be achieved by adjusting arrangement of the servomotors.

**2.3** The oil pressure unit should be checked for correct operation and the pressure relays should be set to operate at required pressures.

**2.4** Tightness of all the pipelines should be checked.

**2.5** All the points should be lubricated by means of locally provided lubricators or from centralized lubrication system.

**2.6** Time of opening and closing of the valve should be regulated by means of throttle device provided. Opening of throttle should be same in both the throttles where two servomotors have been provided. Full stroke of individual servomotors ( stopper to stopper at both ends ) should also be checked and ensured that strokes of both servomotor are equal.

**2.7** Time of opening and closing of by-pass arrangement should be adjusted as specified, by means of throttle device provided either on it or in valve control ( hydraulically ) panel, in case of hydraulic operated by-pass valve.

**2.8** It should be ensured that proper electric wiring has been done for supplying the voltages to the electro-magnets of the slide valves provided for the control of the valve.

**2.9** Contacts of limit switches or any other type of switches should be checked as per the requirement of operation. Correct operation of indicating lamps for different signals should be checked.

**2.10** The correctness of sequence of operations during opening and closing of the valve should be checked.

**2.11** Pressure gauges should be checked and set correctly. Closing of contacts of pressure switches should be adjusted and set at required values.

**2.12** Dust and dirt of all the parts should be cleaned and all the manholes and openings should be closed.

**2.13** After all the above checks are made, the valve should be opened and made sure that all the mechanism of the system are operational and in position corresponding to the open position of the valve.

**2.14** After checking the opening operation, valve should be closed and it should be made sure that all the mechanisms of the system operation are in the position corresponding to the closed position of the valve.

**2.15** The by-pass of repair seal, drain valve of spherical valve and drain valve of penstock should be closed.

**3 CHECKING AND TESTING WITH WATER FILLED PENSTOCK**

**3.1** It should be checked that there is no abnormal leakage of water from penstock, through flange connections of the valve and through other seals.

**3.2** Body of spherical valve may be cleaned by opening the drain valve.

**3.3** Impulse for opening the by-pass valve should be given. After opening the by-pass valve the leakages from the body flange joints, downstream flange joints and from other tappings/connections on body and outlet pipe should be checked. The minimum pressure difference between upstream and downstream should be noted.

**3.4** Opening and closing of the valve should be carried out and correctness of sequence of operation and timings should be checked.

**3.5** Closing the valve from the minimum allowable oil pressure should be checked while pumps of oil pressure unit are stopped.

#### 4 NORMAL OPENING AND CLOSING

Normal opening and closing of the valve should be carried out according to the sequence of operation recommended by the manufacturer.

#### 5 SERVICING DURING OPERATION

5.1 Tightness of all the connections should be checked periodically.

5.2 Lubrication of all the points should be carried out systematically from a centralized lubrication system or from the lubricators locally provided on the points at intervals recommended by the manufacturer.

5.3 Grease should be filled periodically in the tank of lubrication system and in the lubricators locally provided.

5.4 The valve should be periodically flushed through drain pipe so that any silt or debris deposited is washed away.

A silt flushing connection is also given for upstream maintenance seal to be operated to flush/clean back portion of maintenance seal to facilitate proper withdrawal.

5.5 System of indications and signalling should be checked periodically and fused lamps should be changed.

#### 6 CLOSING AND OPENING OF REPAIR SEAL

##### 6.1 Closing of Repair Seal

6.1.1 By-pass of repair seal should be opened at closed position of spherical valve.

6.1.2 Movable ring of repair seal should be moved towards closing by rotating successively diametrically opposite bolts simultaneously

starting from trunnion axis in stages of 1/2 rotation till the seal ring presses against the surface of the rotor.

6.1.3 By-pass of repair seal should be closed.

6.1.4 Water from the body should be drained through drain pipe.

##### 6.2 Opening of Repair Seal

6.2.1 Drain pipe should be closed.

6.2.2 Bolts of repair seal should be moved back, up to the support equal to their free movement.

6.2.3 By-pass of repair seal should be opened and body of spherical valve should be filled with water.

6.2.4 Movable ring of repair seal should be moved towards opening by rotating successively diametrically opposite bolts starting from trunnion axis in stages of 1/2 rotation to its normal position.

6.2.5 By-pass of repair seal should be closed.

6.3 In case of hydraulically operated repair seal the opening and closing of seal should be carried out in accordance with the control scheme recommended by the manufacturer.

#### 7 STORAGE OF SPARE PARTS

7.1 Spare parts should be stored in the proper packings in dry and cool premises. They should be protected against direct sunrays, rainfall and dust.

7.2 The user should check the condition of the spare parts every six months and should properly protect by repainting or repacking if found necessary.

7.3 Spare seals, rubber cords and other rubber parts should be sprinkled with rubber talcum powder and then wrapped in polyethylene paper.

### **Standard Mark**

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.



## Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

### Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc No. RVD 12 ( 84 ).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha  
( Common to all offices )

### Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

{ 331 01 31  
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
{ 37 86 26, 37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

{ 53 38 43, 53 16 40  
{ 53 23 84

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
{ 235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri ( East )  
BOMBAY 400093

{ 632 92 95, 632 78 58  
{ 632 78 91, 632 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.  
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD.  
JAIPUR. KANPUR. LUCKNOW. PATNA. THIRUVANANTHAPURAM.